

Chapter 14 Study Questions

- For the following solutions, indicate whether they are acid, base or neutral:
a) $[H^+] = 1.0 \times 10^{-4} \text{ M}$ b) $[OH^-] = 1.0 \times 10^{-7} \text{ M}$ c) $\text{pH} = 12$ d) $[OH^-] = 1.0 \times 10^{-11} \text{ M}$
- Classify the following as strong acid, weak acid, base or neutral:
a) HCl b) NaCl c) $\text{HC}_2\text{H}_3\text{O}_2$ d) KOH
- In the following equations, label acids and bases, and identify each conjugate acid-base pair.
a) $\text{NH}_3(aq) + \text{H}_2\text{O}(l) \rightarrow \text{NH}_4^+(aq) + \text{OH}^-(aq)$
b) $\text{H}_2\text{CO}_3(aq) + \text{H}_2\text{O}(l) \rightarrow \text{HCO}_3^-(aq) + \text{H}_3\text{O}^+(aq)$
c) $\text{HCO}_3^-(aq) + \text{H}_2\text{PO}_4^-(l) \rightarrow \text{CO}_3^{2-}(aq) + \text{H}_3\text{PO}_4(aq)$
- Which of the following has the highest pH?
a) 0.10 M NaCl b) 0.10 M HCl c) 0.10 M NaOH d) 0.10 M $\text{HC}_2\text{H}_3\text{O}_2$
- Which of the following has the lowest pH?
a) 0.10 M NaCl b) 0.10 M HCl c) 0.10 M NaOH d) 0.10 M $\text{HC}_2\text{H}_3\text{O}_2$
- Which of the following has the highest concentration of H^+ ?
a) 0.10 M NaCl b) 0.10 M HCl c) 0.10 M NaOH d) 0.10 M $\text{HC}_2\text{H}_3\text{O}_2$
- Which of the following solutions is a buffer?
a) H_2O and OH^- b) $\text{HC}_2\text{H}_3\text{O}_2$ and $\text{C}_2\text{H}_3\text{O}_2^-$ c) HCl and NaCl

Chapter 14 Summary: Acids and Bases

Arrhenius definition of acids and bases

Bronsted-Lowry definition of acids and bases

Conjugate acid-base pairs

Acid-base reactions

Strong acids (HCl)

weak acids ($\text{HC}_2\text{H}_3\text{O}_2$, acetic acid)

pH

buffers

Answers to Chapter 14 Study Questions

1. a) acid ($[H^+] > 10^{-7} M$) b) neutral c) base ($pH > 7$) d) acid ($[OH^-] < 10^{-7} M$)
2. a) strong acid b) neutral c) weak acid d) base
3. a) $NH_3(aq) + H_2O(l) \rightarrow NH_4^+(aq) + OH^-(aq)$
Base Acid Acid Base
Conjugate acid-base pairs: NH_4^+/NH_3 & H_2O/OH^-
- b) $H_2CO_3(aq) + H_2O(l) \rightarrow HCO_3^-(aq) + H_3O^+(aq)$,
Acid Base Base Acid
Conjugate acid-base pairs: H_2CO_3/HCO_3^- & H_3O^+/H_2O
- c) $HCO_3^-(aq) + H_2PO_4^-(l) \rightarrow CO_3^{2-}(aq) + H_3PO_4(aq)$.
Acid Base Base Acid
Conjugate acid-base pairs: HCO_3^-/CO_3^{2-} & $H_3PO_4/H_2PO_4^-$
4. c) 0.10 M NaOH (It's the only base)
5. b) 0.10 M HCl (It's the only strong acid)
6. b) 0.10 M HCl (The strong acid has the highest H^+ concentration)
7. b) $HC_2H_3O_2$ and $C_2H_3O_2^-$ (weak acid + conjugate base)